UNCANNY VALLEY

BY
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Submitted to the faculty of the
Jacobs School of Music in partial fulfillment
of the requirements for the degree,
Master of Music,
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Prof. Aaron Travers, Director of Thesis

Uncanny Valley

for orchestra

Louis Goldford (2014)

Uncanny Valley
for orchestra

program note

When I began writing *Uncanny Valley* in January 2014 I was unaware that my own teacher John Gibson had written a work with the same title for piano, electronics, and speaker. I later learned that Nicholas Vines had written an identically titled work for solo piano as well. (Despite these coincidences, both composers gave me their blessings to proceed with writing a new work for orchestra.) It would seem that I've joined the ranks of a privileged and curious few composers who have been charmed by this concept of the uncanny valley, a theory originally proposed in 1970 by the roboticist Masahiro Mori in a paper for the Japanese journal *Energy*.

The theory states that as robots achieve a more humanlike appearance, actual humans find them increasingly familiar, gaining affinity for them until a point is reached when suddenly real people are suddenly repelled. The theory is best represented as the graph of a two-dimensional curve with human likeness on an x-axis and affinity (i.e. familiarity and agreeability among real people) on its y-axis, telling the story of this human response to robots or, in a larger sense, to any inanimate object that could appear to "be human."

As the response to this non-human entity becomes more positive, a sudden dip in the curve heralds a state of absolute repulsion—the curve dips down into a valley of minimal-to-no affinity whatsoever, after which it begins to rise again. This valley of the uncanny, of repulsion and eeriness may be due to what Mori identifies as "a form of instinct that protects us from proximal, rather than distal, sources of danger. Proximal sources of danger are corpses […] and other entities we can closely approach. Distal sources of danger include windstorms and floods." The paper gives a number of examples of these entities and locates them at various points along the curve—dolls, masks, healthy and ill people, Bunraku puppets, etc.—while corpses, zombies, prosthetic and myoelectric hands reside at various points in the valley.

I became interested in Mori's theory after viewing David Lynch's documentary on surrealist cinema for the BBC (1987). Among the films screened in this documentary was *The Girl with the Prefabricated Heart* (1947) by Fernand Léger, which features mannequins filmed up-close. "I guess anything that looks human but isn't is frightening," Lynch spoke of the mannequins. "It goes back to this tremendous fear of the unknown." Why is it that mannequins or masks often appear to be scary or unsettling? What are their musical parallels?

In *Uncanny Valley* (2014) for orchestra, the graphical curve Mori used to illustrate his theory is treated as a control source, governing the piece's formal design and the movement of individual sounds. The large-scale movement of the piece is between the orchestrations of two source sounds—both samples I made of prepared pianos. The curve acts as the non-linear "morph" between these sounds. In this way, Mori's curve has been represented both metaphorically and empirically in the music.

When the curve is in its valley, the orchestrations most closely resemble a piano sounding its lowest note, the lowest key of A0, its thick string scraped with the fingernail while the damper pedal allows its resonances to decay for as long as the string will vibrate. In the valley of the score, the quiet, rolling percussion including low timpani, tubular bells, and gongs (excited by dragging superball friction mallets across them), attempt to recreate the residual noise along with the delicate resonances in the winds and strings, each derived from a time-series analysis of the sound.

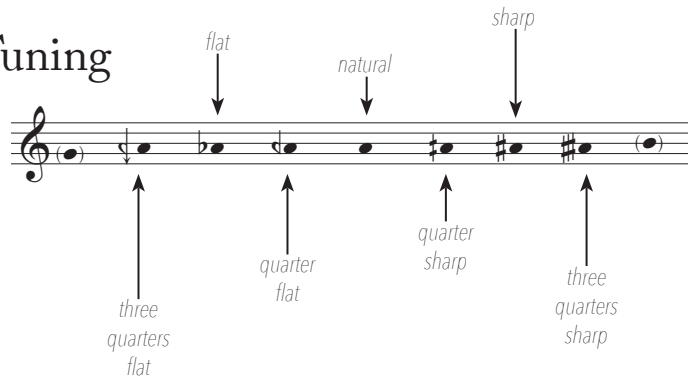
Towards the end of the piece when the curve is at its highest (representing the highest level of affinity for the non-human entity) the orchestrations most closely approximate the sound of another key, a G3 prepared with magnets. Placed directly on the strings, these magnets reveal beautiful inharmonic timbres as the key is pressed. The work progresses along the curve and moves between these sounds as the curve gets closer to one extreme or another.

Both sounds were analyzed for their internal frequency content, which was then orchestrated and used as a compositional basis for the piece. An application was developed to allow the uncanny valley curve to "morph" one sound into another. These tools of computer-assisted composition (CAC) were essential to constructing the raw materials of the piece, opening up the creative space necessary to make a majority of compositional decisions by hand.

Louis Goldford
December 2014
Bloomington, IN

performance notes

Tuning

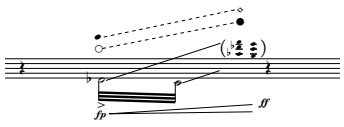


Winds, strings, and brass instruments often employ the use of quartertones.

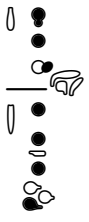
Clefs

Contrabass, contrabassoon, and contrabass clarinet all use the octavo bass clef. Piccolo is notated with the octavo treble clef. Glockenspiel and crotales sound two octaves higher than notated. The score is in C.

Woodwinds



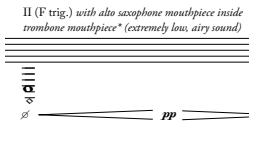
Flute harmonic glissando. Tremolo on indicated fundamentals and glissando towards parenthesized partials. Dotted lines indicate: Gradually move from an air sound to a tone sound, and from a pure tone to a harmonic tone.



The oboe multiphonic in mm. 101 may pose problems on certain instruments. Generally, the player should choose a fingering that most closely obtains the indicated partials, with this fingering as a suggestion.

Brass

Trumpets and trombones will be asked for Harmon mutes. Trumpets will also be asked for metal straight mutes.



Trombones in mm. 89 - 96 are instructed to use alto saxophone mouthpieces. Insert the alto sax mouthpiece into the trombone mouthpiece and play using a saxophone embochure (trombonist David Whitwell has extensively developed this technique and assures that the correct embochure can be properly obtained by a trombonist within 10 minutes). The correct embochure will produce subharmonics, such as the one indicated with the diamond notehead below the slide position indicted with the whole note.

Percussion

Instruments are listed per part on the reverse page and on the first page of score.

Strings: Bowing Positions

E.S.P. = *extreme sul ponticello* (half on the bridge; fundamental disappears)
S.P. = *sul ponticello* (as close to the bridge as possible, at times on the bridge)
S.T. = *sul tasto* (bow over the fingerboard; dull sound)
N. = *normale (ordinato)* (regular bowing position)

Strings: Articulations

c.l. batt. (col legno battuto)
One firm strike of the bow wood against the string at the indicated pitch.

c.l. jetté (col legno jetté)
Repeated jetté of the bow wood against the string at the desired pitch. Often bracketed numbers (i.e. ) are employed to show *approximately* how many rearticulations are to be obtained over the indicated duration.

Basses: Scordatura

In mm. 81, basses 4, 5, and 6 are instructed to detune their low E strings to obtain the A1 below their E2. This tuning remains in effect through the end of the piece. All pitches represented for these bass parts assume that the player adjusts positions to obtain the indicated concert pitches.

instrumentation

2 piccolos
flute (doubling piccolo)
clarinet in E♭
clarinet in B♭
bass clarinet (doubling contrabass clarinet)
2 bassoons
contrabassoon

4 horns
3 trumpets in C (1st player doubling piccolo trumpet in A)
2 trombones
bass trombone
tuba

timpani

percussion 1
    tubular bells
    bass drum
    large tam tam

percussion 2
    bass drum
    vibraphone
    glockenspiel
    tubular bells

percussion 3
    crotales
    vibraphone
    32" gong
    large tam tam
    3 Chinese cymbals (recommended: 27" 16" and 11")

harp
piano

strings (14 12 10 8 6)

DURATION ca. 11:00

Score in C

Uncanny Valley

for orchestra

Louis GOLDFORD (2014)

Without restraint [♩ = 60]

Piccolo 1
Piccolo 2
Flute
Oboe 1
Oboe 2
English Horn
Clarinet in E♭
Clarinet in B♭ 1
Clarinet in B♭ 2
Bassoon 1
Bassoon 2
Contrabassoon
Horn in F 1
Horn in F 2
Horn in F 3
Horn in F 4
Trumpet in C 1
Trumpet in C 2
Trumpet in C 3
Trombone 1
Trombone 2
Bass Trombone
Tuba
Timpani
Percussion 1
tubular bells
bass drum
large tam tam
Percussion 2
bass drum
vibraphone
glockenspiel
tubular bells
Percussion 3
crotales
vibraphone
32" gong
large tam tam
3 Chinese cymbals
Harp
Piano

Without restraint [♩ = 60]

Violin I
div. en 4
Violin II
div. en 4
Viola
div. en 4
Cello
div. en 3
Contrabass

1 2 3 4 5 6 7

A

Picc. 1
Picc. 2
Fl.
Ob. 1
E. Hn.
E♭ Cl.
B♭ Cl. 1
Bsn. 1
Bsn. 2
C. Bn.
Hn. 2
C Tpt. 1
C Tpt. 2
Tbn. 1
Tbn. 2
B. Tbn.
Pno.
Vln. I
div. en 4
Vln. II
div. en 4
Vla.
div. en 4
Cello
div. en 3
C.B.

Flz.

metal straight mute

to Harmon mute...

fully stopped

8 9 10 11 12 13

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
Hn. 1
Hn. 2
Hn. 3
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Vln. I div. en 4
Vln. II div. en 4
Vla. div. en 4
Cello
C.B. div. en 2

B

bass clarinet

Harmon mute (stem in)

metal straight mute

fully stopped

open

to vibraphone...

div. en 3 (next page)

14 15 16 17 18

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 2
Hn. 3
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tuba
Timp.
Perc. 2 [vib.]
Vln. I div. en 4
Vln. II div. en 4
Vla. div. en 4
Cello div. en 4
C.B. div. en 3

(open)
open
to piccolo trumpet in A (with Harmon mute if poss.)...
to Harmon mute...
to Harmon mute...
mf sempre secco
vibraphone [soft yarn mallets]
mp Ped. throughout
f sub.
mf molto vib.
ff
mf

19 20 21 22

C

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
C. Bn.
Hn. 1
Hn. 2
Hn. 3
Picc. Tpt.
C Tpt. 2
Tbn. 1
Tbn. 2
Tuba
Timp.
Perc. 2
[vib.]
1
Vln. I
div. en 4
2
Vln. II
div. en 4
Vla.
6
(solo)
Cello
1 en 4
C.B.
(tutti)

to piccolo...
Harmon mute (stem in)
(in stand if no picc. trp. mute)
Piccolo Trumpet in A
Harmon mute (stem in)
(Harmon mute, cont.)
(Harmon mute, cont.)
to bass drum...
hold Ped. until decay...
C
II
molto vib.
(II)
senza vib.
(II)
senza vib.

23 24 25 26

D

B. Cl.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Picc.Tpt.
C Tpt. 2
C Tpt. 3
Harmon mute (stem in)
Tbn. 1
Tbn. 2
B. Tbn.
(Harmon mute, cont.)
Tuba
Timp.
bass drum
Perc. 2 [bass dr.]

D

Vln. I div. en 3
S.P.
N. gliss.
Vln. II div. en 4
gliss.
senza vib.
I
II
1
2
3
Vla.
4
III
5
6
Cello div. en 4
C.B.

27 28 29 30 31 32 33 34

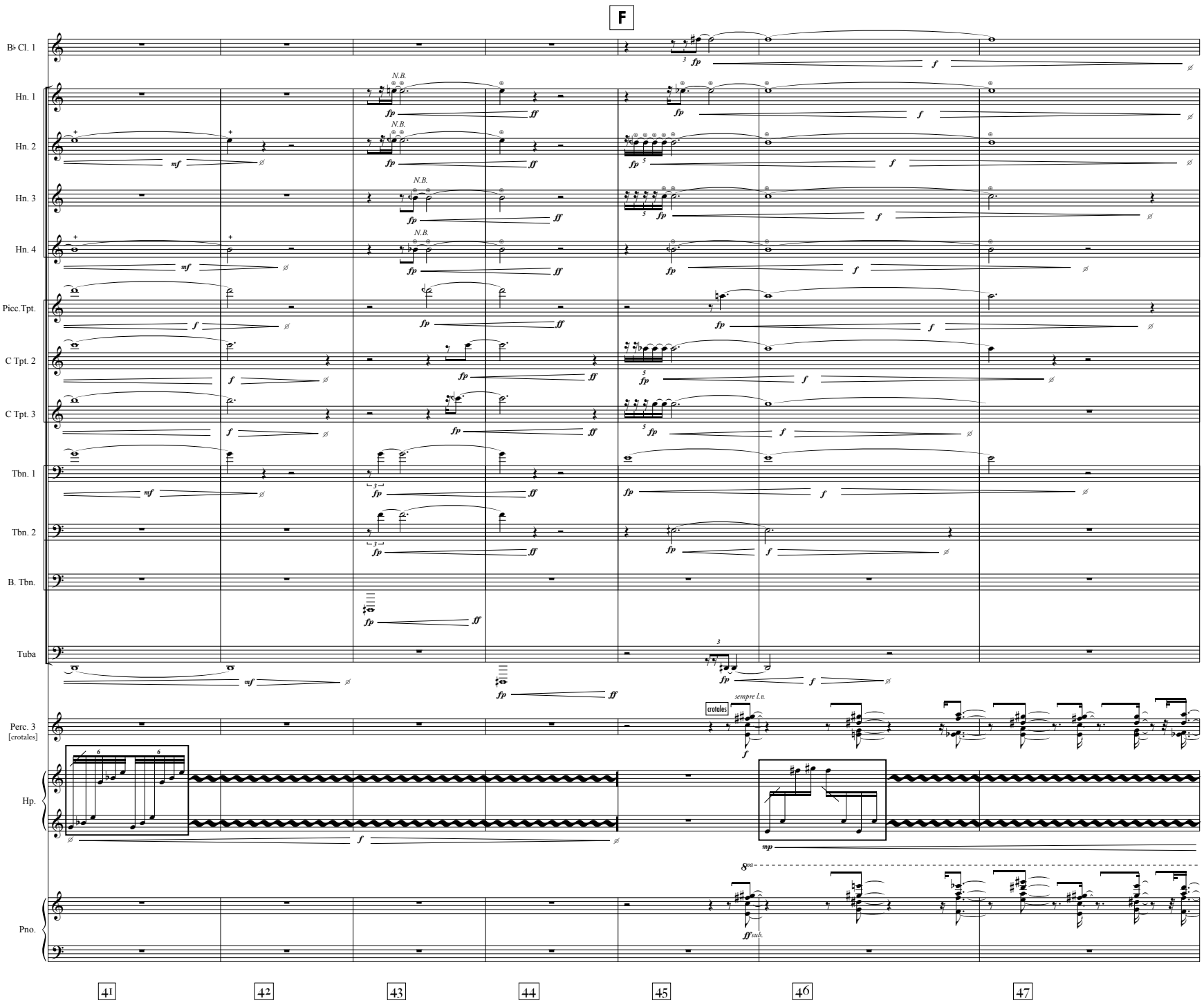
E

Hn. 1
Hn. 2
Hn. 3
Hn. 4
Picc.Tpt.
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 2 [bass dr.]

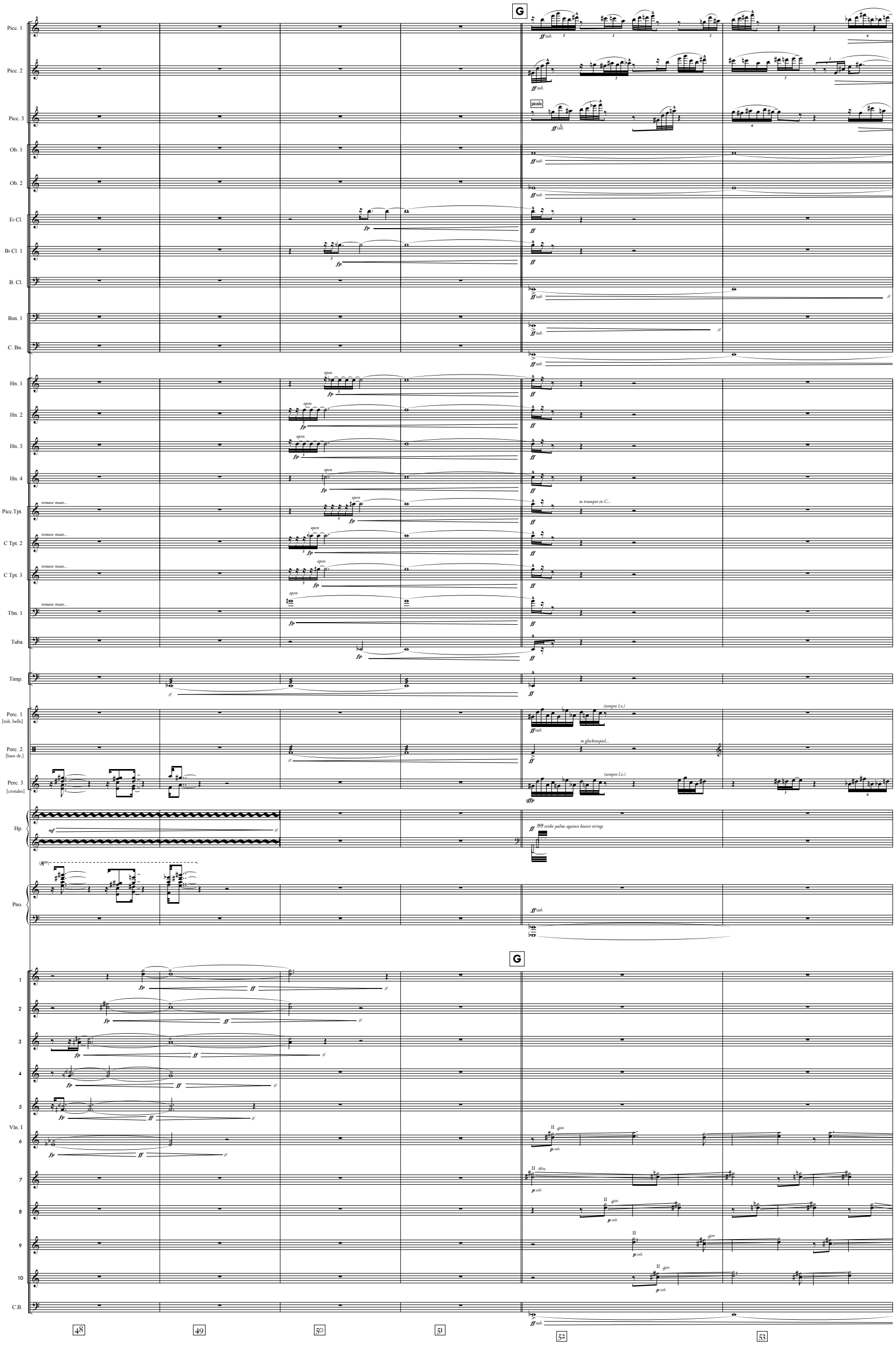
E

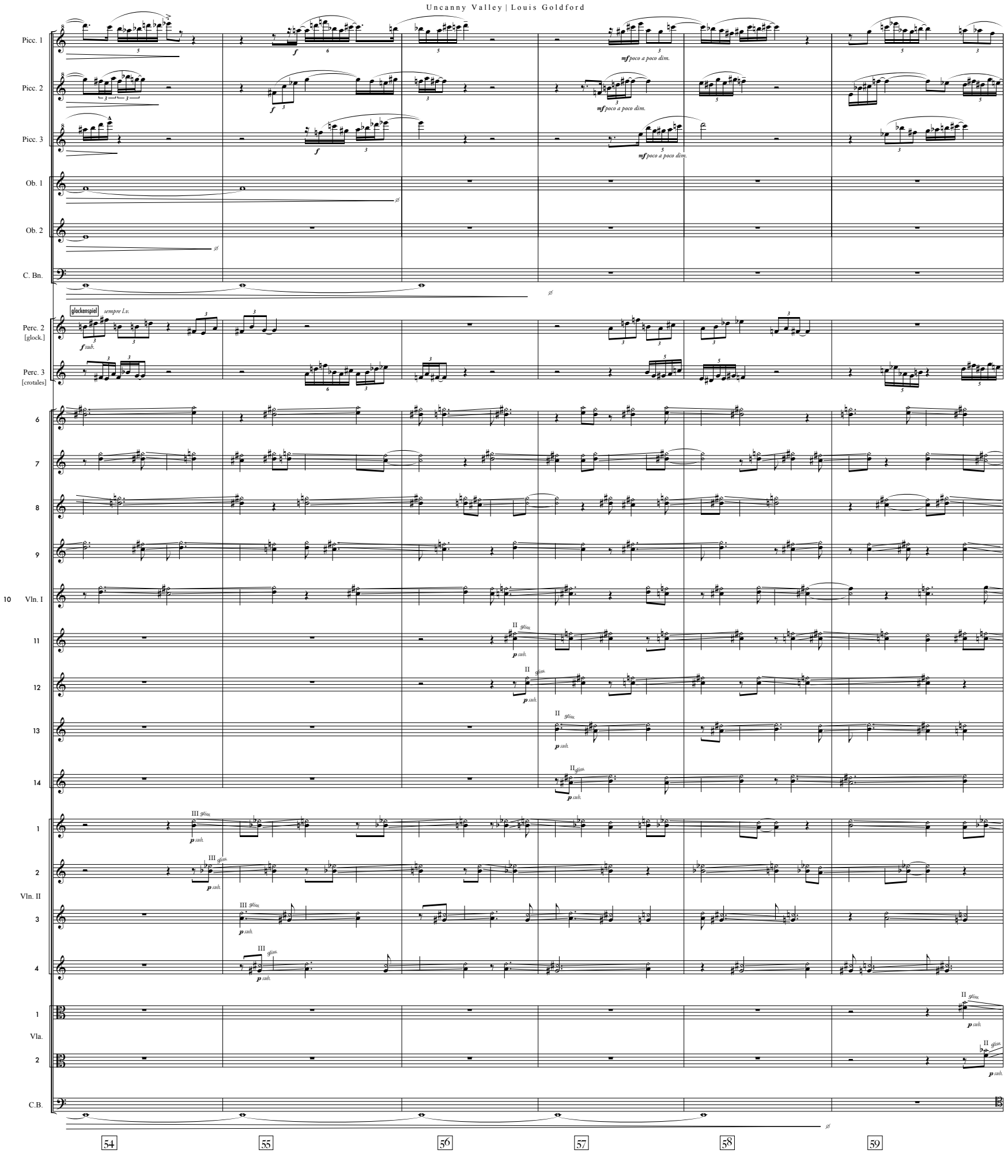
Vln. I *div. en 3*
Vln. II *div. en 4*
Vla.
Cello *div. en 4*
C.B.

35 36 37 38 39 40



N.B. This symbol is used to denote the half-stop.


G
Picc. 1
Picc. 2
Picc. 3
piccolo
Ob. 1
Ob. 2
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
C. Bn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Picc.Tpt.
C Tpt. 2
C Tpt. 3
Tbn. 1
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Perc. 3 [crotales]
Hp.
Pno.
Vln. I
C.B.
open
remove mute...
to trumpet in C...
to glockenspiel...
(sempre l.v.)
strike palms against lowest strings
gliss.
48
49
50
51
52
53


Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
C. Bn.
glockenspiel
sempre l.v.
Perc. 2 [glock.]
Perc. 3 [crotales]
Vln. I
Vln. II
Vla.
C.B.
mf poco a poco dim.
II gliss.
III gliss.
p sub.
54
55
56
57
58
59

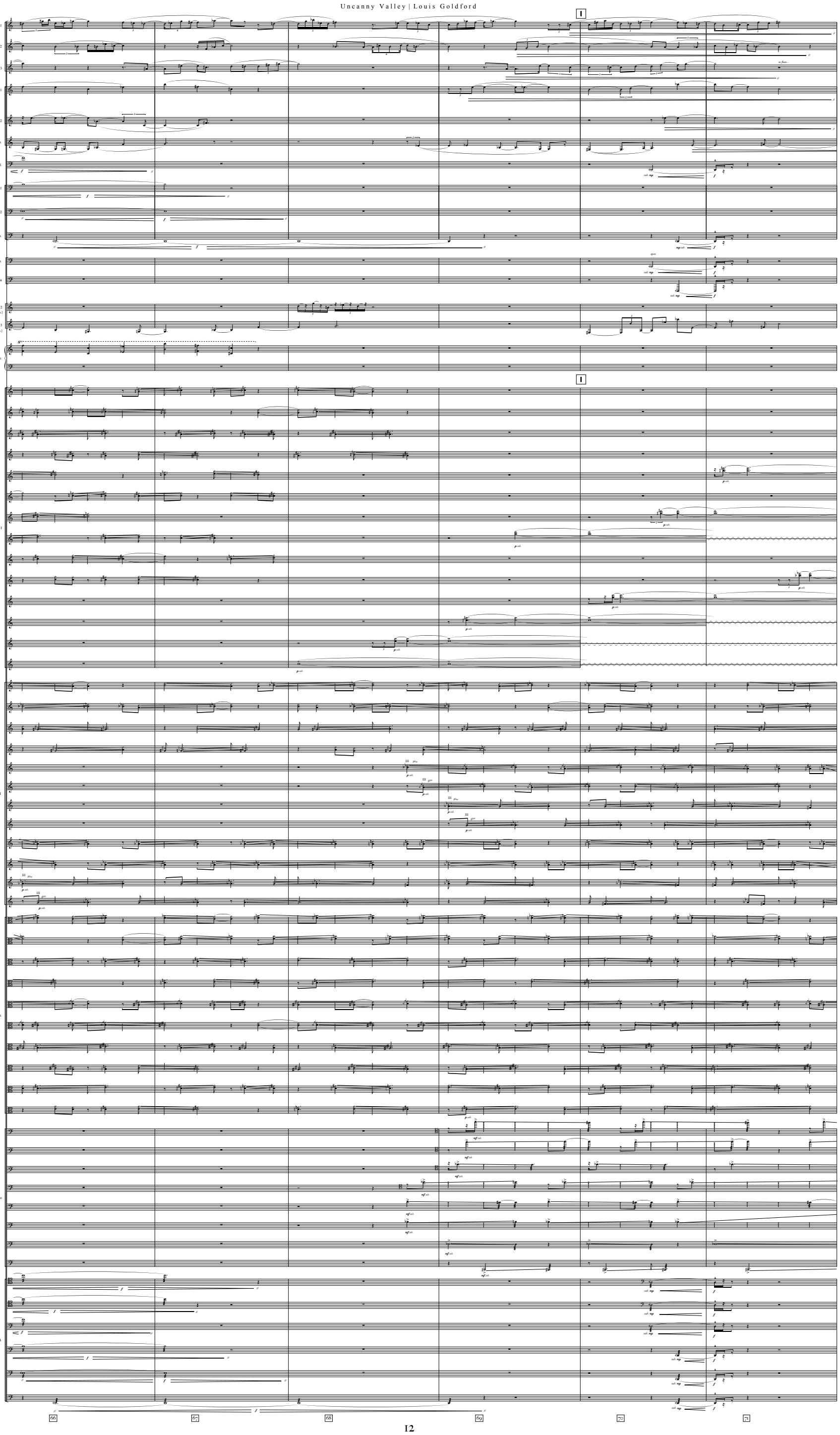
H

Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
E. Hn.
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
Perc. 2 [glock.]
Perc. 3 [vib.]
Hp.

H

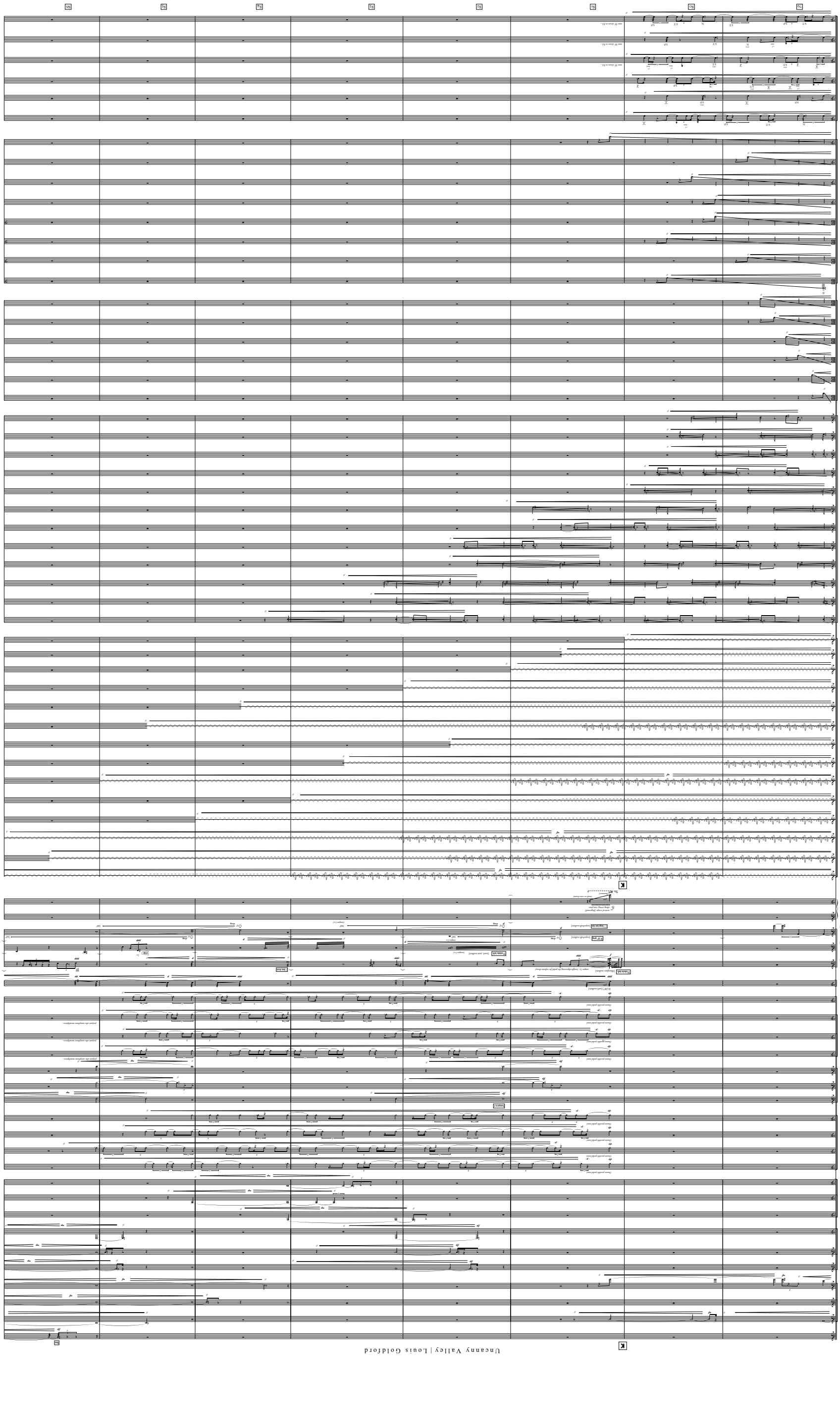
1
2
3
4
5
6
Vln. I
8
9
10
11
12
13
14
1
2
3
Vln. II
4
5
6
1
2
3
Vla.
4
5
6
7
8
9
10
1
2
3
C.B.
4
5
6

60 61 62 63 64 65


I
Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
E. Hn.
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
B. Tbn.
Tuba
Perc. 2 [glock.]
Perc. 3 [vib.]
Hp.
Vln. I
Vln. II
Vla.
Cello
C.B.
66
67
68
69
70
71

Ob. 1
Ob. 2
E. Hn.
Perc. 3 [vib.]
Vln. I
Vln. II
Vla.
Cello
C.B.

72 73 74 75 76 77 78



L

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
C Tpt. 1
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [vib.]
Perc. 3 [gong] [tam tam]
Vln. I 1
Vln. II 12
Vla.
Cello
C.B. 1 - 3

II (F trig.) *with alto saxophone mouthpiece inside trombone mouthpiece* (extremely low, airy sound)*

to oboe...

to contrabass clarinet...

similar

Vib.

(Freely permutate pitches. As comfortably fast as possible.)

drag

S.T.

senza vib.

87 88 89 90 91 92 93 94

*Use of the alto saxophone mouthpiece with a trombone is described in the score preface.

N.B. This oboe multiphonic is discussed in the score preface.

108
107
106
105
104
103
102
Picc
Fl 1
Fl 2
Ob 1
Ob 2
E♭ Cl
B♭ Cl 1
C Bs Cl
Bsn 1
Bsn 2
C Hn
Hn 1
Hn 2
Hn 3
C Tpt 1
C Tpt 2
C Tpt 3
Tbn 1
Tbn 2
B Tbn
Tuba
Timp
Perc 1 [bass tom]
Perc 2 [bass dr.]
Perc 3 [fx, cym.]
Pno
Vln I
Vln II
Vla
Vc
Cb
N
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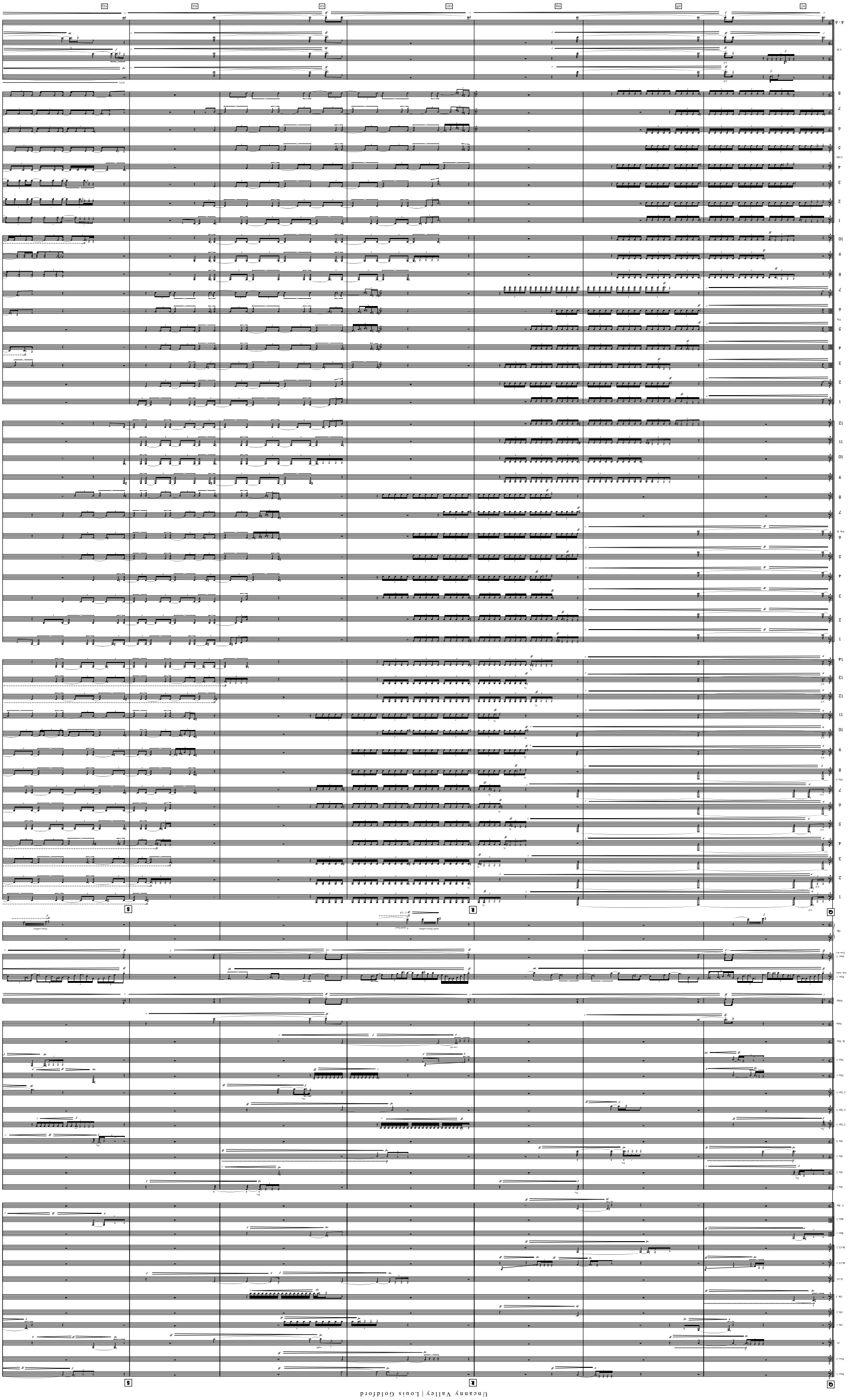

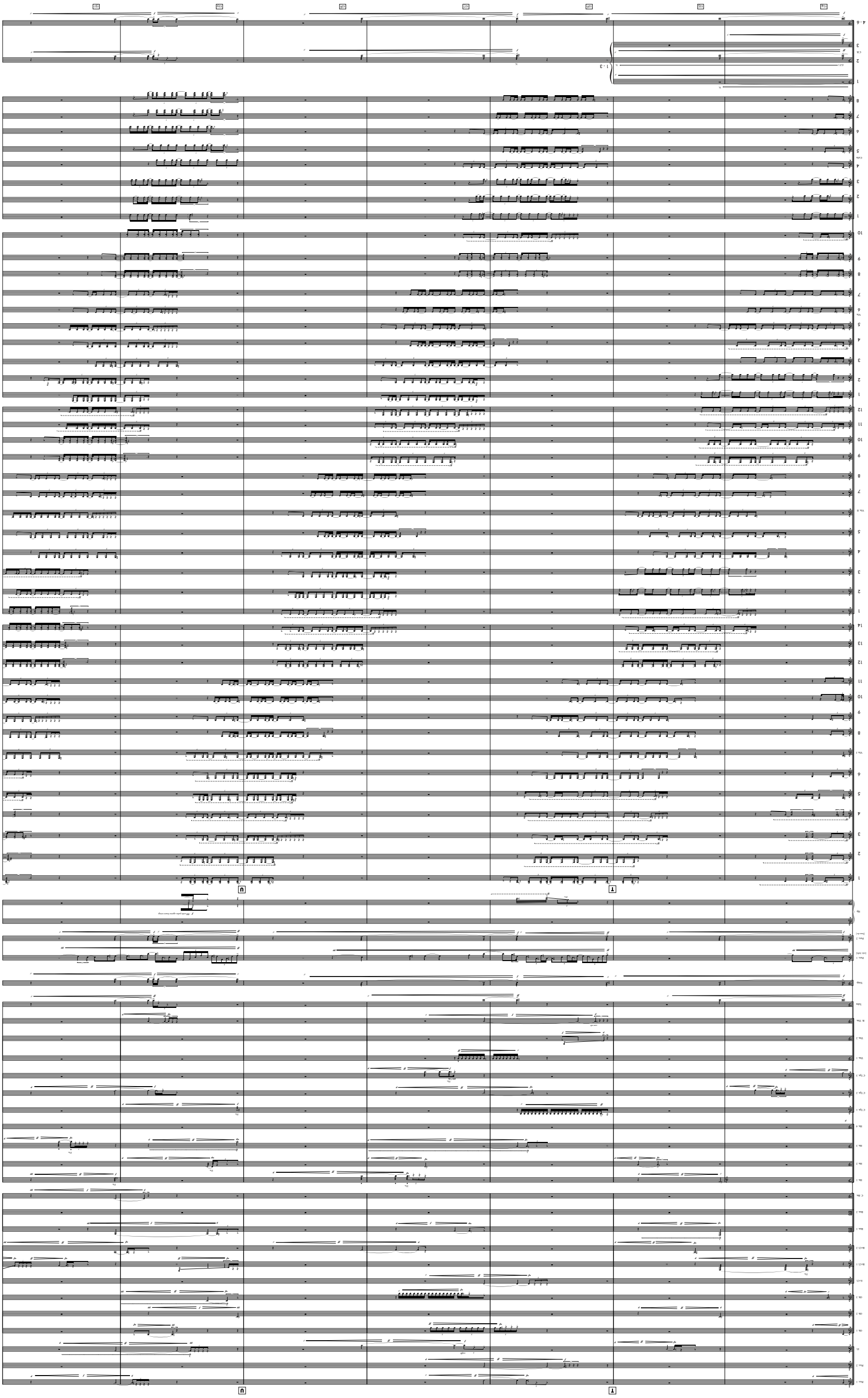

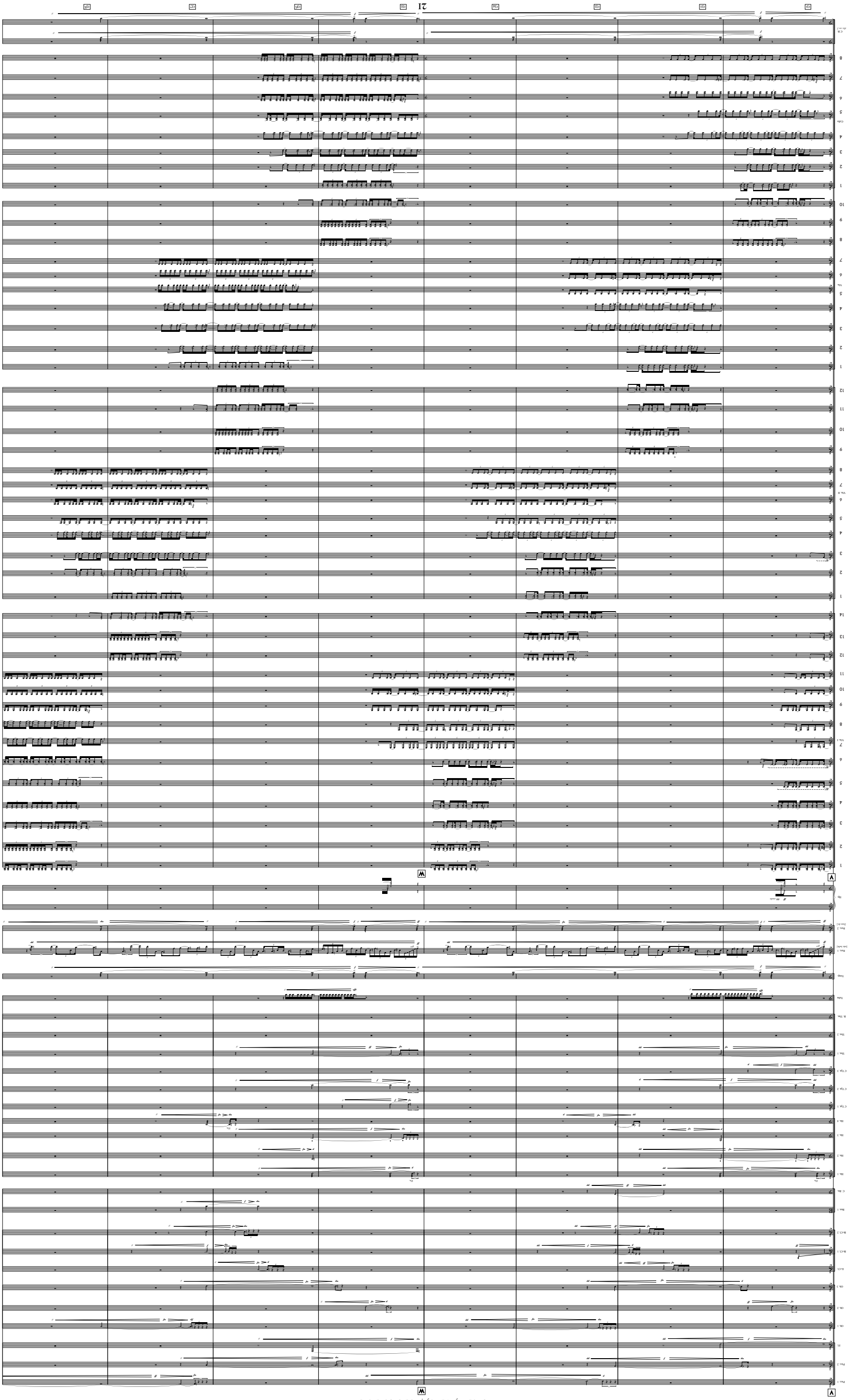
12
11
10
9
8
7
Vln. II
6
5
4
3
2
1
14
13
12
11
10
9
8
7
Vln. I
6
5
4
3
2
1
V
W
Hp.
Bass. 2
Bass. 1
Timp.
Tuba
B. Tbn.
Tbn. 2
Tbn. 1
C. Tpt. 2
C. Tpt. 1
Hn. 4
Hn. 3
Hn. 2
Hn. 1
C. Bn.
Bsns. 1
Bb Cl. 2
Bb Cl. 1
Eb Cl.
Cls. 3
Cls. 2
Cls. 1
Fl.
Picc. 2
Picc. 1
V
W

Z

AA

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Hp.

Vln. I
Vln. II
Vla.
Cello
C.B.

div. en 6 (next page)

143 146 147 148 149 150

BB

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Perc. 3 [tam tam]
Hp.

Flz.

[fiberglass]

[triangle beaters]

large tam-tam

BB

1
2
3
4
5
6
7
Vln. I
8
9
10
11
12
13
14

Vln. II
div. en 6.

1
2
3
Vla.
4
5
6 - 10

1
2
3
Cello
4
5 - 8

1
2
C.B.
3
4 - 6

p div.
mp div.
mf div.
ff div.
sl. bart.

N Gradually slow tremolo down...

...to a steady pulse.

(N.)

(N.) Gradually speed bowing back up (while moving bow towards F.S.P.)...

151 152 153 154 155 156 157

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob.
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1
Perc. 2
Perc. 3
Hp.
4
5 Vla.
6 - 10
2
3 Cello
4
5 - 8
1
2 C.B.
3
4 - 6

...to an infinitely faster, disappearing tremolo. E.S.P.

(N.) Gradually speed bowing back up (while moving bow towards E.S.P.)...

158 159 160 161 162 163

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